MONTHLY JOURNAL OF THE MUSHROOM GROWERS' ASSOCIATION

MGABULLETIN

NOVEMBER 1960

NUMBER 131

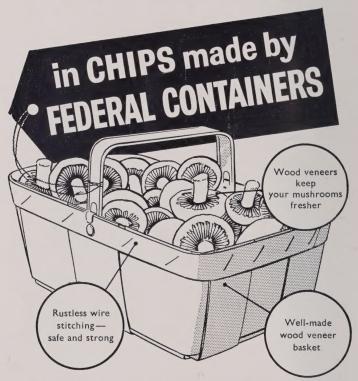
CONTENTS	Page
Editorial: Mushroom Industry in England and Wales Lit Up	417
COMPLETE ENGLAND/WALÉS MUSHROOM SURVEY	418
Stanley Middlebrook's Pinheads	430
Food Fair: Olympia, 1960	433
Improved Cropping from Washing Down with "Pepsan":	
Hugh Claxton	435
Presented to H.M. The Queen and the Duke of Edinburgh	
(Mr. and Mrs. J. Beveridge)	436
WESTON-SUPER-MARE CONFERENCE	441
On Southern T.V	452
Calypso: "The Mushroom Grower's Nightmare"	
	453
By FP (Belfast)	
CULTIVATED MUSHROOM: Dr. H. J. Tschierpe (Part VI-2)	455 %
Small Advertisements	464



COMPLETE ENGLAND-WALES
MUSHROOM SURVEY

a 7 Novigen

Your mushrooms are safer and travel better



They're better-made to give maximum protection

Chips by Federal Containers give your mushrooms maximum protection. Finely made, these wood veneer baskets are stitched with rustless wire for strength and safety. Wood veneers are better for protecting the freshness of

your produce. Besides mushroom chips, we can supply the covers, printed to your requirements. And we make baskets, punnets and containers in all shapes and sizes for the fruit and vegetable trades.

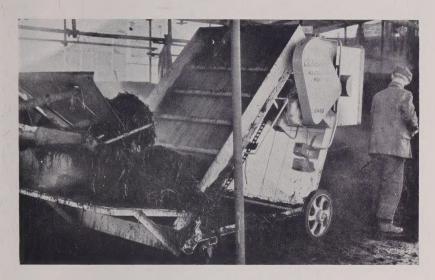
FEDERAL CONTAINERS LIMITED

AGRICULTURE HOUSE, 25/31 KNIGHTSBRIDGE, LONDON, S.W.1

Factories at HIGHER KELLY, CALSTOCK, CORNWALL OLDFIELD LANE, WISBECH, CAMBS.

PERFECT COMPOSTING

with the



CHATSWORTH COLT

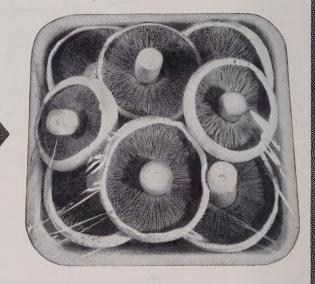
- ★ The machine with the rubbing action beater and the High Throw Roller for easy stacking.
 - ★ Available 2' 6" or 4' wide, with electric, petrol or diesel motor.

AS ILLUSTRATED ABOVE THE COLT IS 4 ft. WIDE, POWERED BY ELECTRIC MOTOR AND FITTED WITH MIST SPRAY WATERING DEVICE.

H. D. STEELE & SON, LTD. RAILWAY APPROACH, WORTHING, SUSSEX

Tel.: WORTHING 2527.

Hartmann containers keep pre-packed mushrooms fresh for days!



These neat fibre containers, sealed with acetate film, retain the 'just-picked' freshness of mushrooms. They're inexpensive, display well, bring you quick sales, quick profits. Ideal for Supermarkets, Self-Service Stores, Fruiterers', Greengrocers', Butchers' Shops, Grocery Stores, etc. Write for details to:

THE HARTMANN FIBRE COMPANY LIMITED

CITY WALL HOUSE, FINSBURY SQUARE, LONDON EC2 Tel: MONarch 1383/5

Growers deserve a different kind of break!



As a grower you face many different kinds of hazards, some peculiar to your particular business.

Glass can be shattered by hail, snow and wind...produce can be pilfered in transit...boilers may burst...claims against you may be made by employees or members of the public for injuries sustained on your premises...sickness may ay you low.

Give yourself that better "break" by getting specialist service and specialist insurance cover from the



THE NATIONAL FARMERS UNION MUTUAL INSURANCE SOCIETY LIMITED

Head Office: STRATFORD-ON-AVON



ONLY 12/6 each

CONTROL MUSHROOM FLIES QUICKLY CHEAPLY SIMPLY

One hour's Fumigation weekly keeps Houses free of Flies

Sole Distributor to Mushroom Industry:

SHIRLEY ORGANICS LIMITED VICARAGE WHARF BATTERSEA S.W.II

PHONE : BATTERSEA 1016

Manufactured by:

VULCAN FUMIGATOR CO. LTD.
3 NEW LONDON STREET, LONDON, E.C.3

PHONE: ROYAL 4324

Leaflets from Manufacturers for details of use in Homes, Poultry Houses, Greenhouses, etc.







SINDEN PROCESS GRAIN SPAWN

Manufactured by

E. HAUSER, CHAMPIGNON LABORATORIUM, GOSSAU - ZURICH

Sole distributor U.K., EIRE:

S. A. F. SAMPSON LTD., OVING, CHICHESTER

Telephone: Chichester 4455/6

Telegrams: SAMPSON, Chichester

SINDEN PROCESS GRAIN SPAWN

Manufacturer: E. Hauser, Champignon Laboratorium, Gossau-Zürich

NOV. - 1960 NUMBER 131

Executive Committee:

Executive Committee: P. B. STANLEY-EVANS (Chairman) GRAHAM GRIFFITHS (Vice-Chairman) MESSRS. G. V. ALLEN FRED. C. ATKINS G. W. BAKER J. G. BATCHELOR A. J. BERRY

Editorial Board: FRED. C. ATKINS DR. R. L. EDWARDS Hon, Treasurer: F. L. FILMER Editor & Secretary:

MESSRS, F. BLEAZARD R. DUMBRECK DR. R. L. EDWARDS E. A. GOOK J. A. LINFIELD A. A. SPENCER Telephone: Belgravia 5077 R. THOMPSON

No responsibility can be accepted by the Editor, the Editorial Board, or the Mushroom Growers' Association for statements made or views expressed in this Bulletin, or for any advertisements included in this publication.

WINSTON ALDERTON

EDITORIAL

MUSHROOM PRODUCTION LIT UP

The publication by the Ministry of Agriculture of a thorough and comprehensive report on cultivated mushroom production in England and Wales is a splendid thing, providing as it does, and for the first time, some fully authenticated facts and figures, gathered together after a most painstaking enquiry. It is particularly gratifying that over 80% of the Grower Members of the MGA voluntarily co-operated with the Ministry. The Ministry were at full stretch to make sure that this enquiry embraced as many growers as possible and, where a grower declined to co-operate his production figures were estimated.

Although the MGA represents nearly 85% of the total production —and this proportion may well be nearer 90% now as Grower Membership has increased since the report was completed last May—there is no cause for complacency. Indeed, and perhaps since the MGA sets its sights high, the fact that there are so many producers outside the organisation is a little disturbing, even though the majority of them are obviously small producers, many turning to mushrooms as a catch crop. No effort should be spared to get them into the MGA fold. One of the main troubles is locating these producers—rightly no information is available on this point from the Ministry. But the spawn manufacturers and distributors must know! Perhaps, one day, they will tell us.

This report then is most welcome and, with the exception of total production, by and large confirms the estimates which have been put out by the MGA from time to time. Obviously the estimate of total production has been too high—we have claimed 40 million lb. for the United Kingdom for some years. But if the staggering production increase of 20% has been maintained, then 40 million may well be correct now.

Some additional and enlightening information, not included in the report, is that 64% of the total bed area is concerned with tray production, 24% with shelves, 9% ridge beds and 3% flat beds.

COMPLETE ENGLAND/WALES MUSHROOM SURVEY

Nearly 85% from MGA Members

For the first time ever a complete survey has been carried out by the Ministry of Agriculture covering the question of mushroom production throughout England and Wales and the findings of the Ministry are published herewith in full.

That the main area of production is situated in West Sussex will come as no surprise, containing as it does the nurseries of A. G. Linfield Ltd., with their tremendous production: but even without them West Sussex still prevails in mushroom production.

The survey covered the 12 months ending on 31st May, 1959, and the estimated production for the year ended 31st May, 1960. Total production figure to May, 1959, is given as 26.7 million lb. which was estimated to have increased by 23.1% a year later to 32.8 million lb. with the MGA's share of this production standing at 83.5% non MGA members producing only 16.5% or 5.4 million lb. In actual fact the MGA's share of this production was higher than the figure given as one MGA member alone who had been included in the non MGA section was responsible for 1% of the total production which would bring the MGA share to 84.5% and the non MGA production to 15.5%. Since there has been a steady increase in MGA Grower Membership since the survey was completed it seems likely that the 84.5 figure no longer stands and may well be nearer the 90% mark.

Some surprise may well be caused by the fact that nearly 70% of the total production is centred on counties within easy reach of London. Lancashire and Yorkshire are responsible for 9% of the total production with the East Riding of Yorkshire showing the highest percentage increase of production between May, 1959, and May, 1960, the figure being 45%. Surrey showed an increase of 34% and Nottingham and Hertford each had a 33% increase.

On all the 480 holdings on which mushrooms were produced the average spawn rate per carton was 28.8 sq. ft., giving an average production per carton of 41.1 lb. The fact that non MGA members produced 42.7 lb. per carton against 33.4 by MGA members should not be confused with total production per sq. ft. per annum. Non MGA members put through less crops per year and, by cropping longer produced more mushrooms per carton of spawn. The number of crops per annum by MGA members is given as 3.56 (2.35 non members) and average yield per annum per sq. ft. as 5.19 lb. for members (2.99 non members). Average size of the MGA member's farm is about $16\frac{1}{2}$ thousand sq. ft. of mushrooms beds (7,4000 sq. ft. non members).

The report shows that 16 farms in England and Wales were producing between 8 and 10 lb. per sq. ft. per year and all were MGA members. Of the 92 farms producing between 5 and 10 lb. per sq. ft. per year all but 13 were MGA members.

MUSHROOM SURVEY 1959

All Counties with over 0.5% of total production 1958/59



This map shows the main mushroom producing areas in England and Wales. Note the heavy concentration around London, an area growing more than 60% of the total production.

More than 80% of the MGA members voluntarily took part in this survey—a magnificent example of ready co-operation.

OBJECTS AND DESCRIPTION OF SURVEY

- 1. A voluntary postal survey of all known commercial growers of cultivated mushrooms in England and Wales was carried out by the NAAS County Horticultural Officers between November, 1959 and March, 1960, to obtain up-to-date information concerning the level and trend in output, the distribution of sales between the various channels of marketing, and the economic and technical structure of the industry.
- 2. The C.H.Os sent out survey questionnaires on which growers were asked to give details of their holdings, their production and their sales in 1958/59, and their expected production in 1959/60.
- 3. The C.H.Os sent follow-up letters, and, where necessary, made personal visits to non-responders. Wherever possible they supplied their own estimates of the approximate level of production in cases where this information could not be obtained from the growers.
- 4. Information was received concerning 480 holdings in all, of whom 459 were in production in 1958/59 and 468 in 1959/60. The production data and other statistics set out in the remainder of this Report relate to these holdings. They are believed to include nearly all the commercial growers in England and Wales.

THE SURVEY RESULTS: PRODUCTION IN 1958/59 and 1959/60

Total Production

In 1958/59 production on the 459 holdings in the survey amounted to 26.7 million lb., an average output of 58,100 lb. per holding. In 1959/60 the "expected" production on 468 holdings increased by 23(¹) per cent to 32.8 million lb. and the average output per holding increased by 21 per cent to 70,100 lb.

Regional Distribution (See Appendix, Map and Table I)

Nearly two-thirds of the total England and Wales production comes from the South Eastern Counties. West Sussex alone accounted for 42% of the total output in 1958/59, though the dominating position of this county is due mainly to the fact that it includes the largest grower in the country. Table I shows the number of holdings and the production in 1958/59 and 1959/60 for all counties producing over 0.5% of the total England and Wales output in 1958/59. These 25 counties produce 96% of the total.

Agricultural and Non-Agricultural Holdings (See Appendix Table 2)

In 1958/59 production on the 337 "agricultural" holdings (i.e., holdings with over one acre of land used for agricultural purposes) amounted to 22.7 million lb. or 67,300 lb. per holding. In 1959/60, expected production on 339 agricultural holdings had risen by 23 per cent to 28.0 million lb., and the average output per holding increased, also by 23 per cent to 82,500 lb. In both years agricultural holdings accounted for 85% of total production.

In 1958/59 production on 122 non-agricultural holdings amounted to 4.0 million lb. or 32,600 lb. per holding. In 1959/60 expected production on 129 non-agricultural holdings had risen by 22 per cent to 4.8 million lb., and the average output per holding increased by 15 per cent to 37,600 lb.

	All I	Holdings		ultural dings	Non-Agricultural Holdings		
	1958/59	1959/60	1958/59	1959/60	1958/59	1959/60	
No. of Producing Holdings	459	468	337	339	122	129	
Output (million lb.)	26.7	32.8	22.7	28.0	4.0	4.8	
Output (% of all Holdings)	100%	100%	85.1%	85.2%	14.9%	14.8%	
1959/60 Output (% increase over 1958/59)	_	23.1%		23.3%	Whates	22.0%	
Average Output per holding ('000 lb.)	58.1	70.1	67.3	82.5	32.6	37.6	
1959/60 Output per holding: % Increase over 1958/59	Nahatain	20.7	_	22.5	_	15.4	

⁽¹⁾ Percentage increases, and other derived figures, have been calculated on unrounded figures.

MUSHROOM GROWERS' ASSOCIATION MEMBERS¹ AND NON-MEMBERS (See Tables 2, 3 & 4A)

In 1958/59 production of the 264 Mushroom Growers' Association members in the survey amounted to 22.4 million lb., or 84,700 lb. per holding. In 1959/60 the "expected" production from 272 members had risen by 22.5 per cent to 27.4 million lb. and the average output per holding had increased by 19 per cent to 100,700 lb. The proportion of the total output supplied by members of the MGA fell slightly, from 83.9 per cent in 1958/59 to 83.5 per cent in 1959/60.

	All H	oldings	Mo Men		Non-MGA Members		
	1958/59	1959/60	1958/59	1959/60	1958/59	1959/60	
No of Producing Holdings	459	468	264	272	195	196	
Output (million lb.)	26.7	32.8	22.4	27.4	4.3	5.4	
Output(° of All Holdings)	100%	100° o	83.9° ₀	83.5%	16.1%	16.5%	
1959/60 Output (% increase over 1958/59)		23.1%	- ,	22.5%		26.0%	
Average Output per holding ('000 lb.)	58.1	70.1	84.7	100.7	22.0	27.6	
1959/60 Output per holding: % increase over 1958/59	_	20.7%		18.9%	_	25.5%	

In 1958/59 production by 195 growers who were not members of the MGA amounted to 4.3 million lb. or 22,000 lb. per holding. In 1959/60 "expected" production by 196 non-members had risen to 5.4 million lb. and the average output per holding had increased by 25.5 per cent to 27,600 lb. Their share of total production rose from 16.1 per cent in 1958/59 to 16.5 per cent in 1959/60.

Size of Output Distribution (Tables 2 and 3)

There is an extremely wide range in the annual output from individual holdings—from only a few hundred lb. to several millions of lb.—in fact, one grower alone is responsible for over a quarter of the total national production. In 1958/59 18 holdings, each producing over 200,000 lb. per annum, accounted for 49 per cent of the total production. At the other end of the output scale, 346 holdings each producing less than 50,000 lb. per annum accounted for only 19 per cent of the total.

In 1959/60 the number of holdings in the "over 200,000 lb." group had increased to 22, and the proportion of the total output produced by this group was now 53 per cent. The number of holdings producing less than 50,000 lb. per annum had fallen to 333 and their proportion of the total "expected" production was now only 16 per cent.

Distribution of Sales by Channels of Marketing, 1958/59 (Table 2)

In 1958/59, $81\frac{1}{2}$ per cent of total sales were made to wholesale markets, $10\frac{1}{2}$ per cent direct to retailers or consumers, and 8 per cent to canners and processors (mostly by one grower). Table 2 shows the percentage distributions of sales in each group (i.e., agricultural, nonagricultural, MGA members and non-MGA members). The following table shows the percentage distribution of total sales amongst the various groups:—

Distribution of Total Sales, 1958/59

	All Holdings	Ag. Holdings	Non-Ag. Holdings	MGA Members	Non-MGA Members
	0	%	%	0/0	%
To Wholesale Markets	81.5	68.7	12.8	66.9	14.6
Direct to Retailers	8.9	7.2	1.7	7.7	1.2
Direct to Consumers	1.5	1.2	0.3	1.3	0.2
To Canners and Processors	8.1	8.0	0.1	8.0	0.1
Total	100.0	85.1	14.9	83.9	16.1
Million lb	26.7	22.7	4.0	22.4	4.3

TABLE 1

Leading Counties: No. of Holdings and Production in 1958/59 and 1959/60

COUNTIES PRODUCING OVER 0.5% OF TOTAL 1958/59 ENGLAND & WALES OUTPUT

		1958/59		1959/60						
COUNTIES	No. of	Produc	tion	No. of	Production					
COOMILES		No. of Holdings '000 lb. %					% increase over 1958/59			
Sussex West Surrey Essex Lancashire Yorks, W.R. Sussex East Somerset Gloucester Buckingham Hertford Leicester Oxford Nottingham Norfolk Hampshire Yorks, E.R. Berkshire Huntingdon & Soke of Peterboro' Dorset Staffordshire All Other Counties	62 19 46 24 28 40 15 11 10 8 24 8 5 14 9 18 11 10	11,128 1,614 1,538 1,044 1,032 998 995 706 625 586 506 481 438 372 337 321 239	41.7 6.1 5.8 3.9 3.9 3.7 2.6 2.3 2.2 1.9 1.8 1.6 1.4 1.2 0.9	64 19 47 25 28 42 15 12 9 8 23 7 5 16 8 17 11 9	13,991 2,170 1,891 1,318 1,212 1,275 1,191 1,183 726 659 781 602 525 584 423 339 466 266	42.6 6.6 5.8 4.0 3.7 3.9 3.6 3.6 2.2 2.0 2.4 1.8 1.3 1.0 1.4 0.8	26 34 23 26 17 24 19 19 19 3 5 33 19 9 33 14 45 11			
Total England and Wales	459	26,659	100	468	32,806	100	23			

Other Details of Holdings

Information is included in Table 2 of the Appendix concerning:

(i) The average size of holdings.

- (ii) The average annual cropping are per holding.(ii) The average area of bedding space per holding.
- (iv) The average yield of mushrooms per square foot of bedding space per year.

 (v) The average yield of mushrooms per square foot of cropping area
- (i.e. the average yield per crop).

 (vi) The average area of bed space per carton of spawn (i.e. the average
- spawning rate).
 (vii) The average yield of mushrooms per carton of spawn.

Frequency distributions for the main holding details are shown in Table 4 and 4A.



FOR

GOOD-SIZED MUSHROOMS

ΙN

EVERY FLUSH

Write our Technical Director

ROBERT PATTERSON, B.Sc., B.Ag. (Hons.)

Monlough Food Production Co. Ltd.

BALLYGOWAN - BELFAST

'Phone : Carryduff 243 'Grams ' "Monlough, Belfast"

TABLE 2 Estimated output and distribution of Sales on All Known Holdings, Ag./Non Ag., and MGA/Non MGA Groups(1)

	1011 11817		71 1011 171 011	Groups()	
	All holdings	Ag. holdings	Non-ag. holdings	MGA holdings	Non MGA holding
No. of holdings 1958/59 and/or 1959/60	480	349	131	274	206
1958/59 No. of producing holdings Av. Size of holding (acres) Output or Sales (m. lb) Output or Sales (%) Av. output per holding ('000 lb.)	459 30.7 26.7 100.0 58.1	337 41.7 22.7 85.1 67.3	122 0.3 4.0 14.9 32.6	264 32.2 22.4 83.9 84.7	195 28.6 4.3 16.1 22.0
Output-per-Holding Groups ib. per annum	No. % of Total Hldgs. Prod.	No. % of Total Hldgs. Prod.	No. % Total Hldgs. Prod.	No. % of Total Hldgs. Prod.	No. % Total Hldgs. Prod.
Up to49,999	346	250	96	168	178
50,000—99,999	61 15.0	45 10.9	16 4.1	52 12.6	9 7.8
100,000—199,999	34 16.7	27 13.2	7	29	5 2.4
200,000—and over	18 49.0	15 46.0	3 3.5	15 14.1	3 2.6
_			3.0	45.7	3.3
Total	459	85.1	14.9	83.9	195
Distribution of Group Sales To Wholesale Markets Direct to Retailers Direct to Consumers To Canners and Processors	m. % 21.7 81.5 2.4 8.9 0.4 1.5 2.2 8.1	m. lb. % 18.3 80.6 1.9 8.4 0.3 1.5 2.1 9.5	m. lb. % 3.4 86.1 0.5 11.6 0.07 1.8 0.02 0.5	m. 1b. % 17.8 79.6 2.1 9.2 0.4 1.6 2.1 9.6	m. lb. 3.9 90.9 0.3 7.3 0.05 1.1 0.03 0.7
Total	26.7 100.0	22.7 100.0	4.0 100.0	22.4 100.0	4.3 100.0
		1			
Bedding Space (acres) Av./holding ('000 sq. ft.) Av. yield p.a. (lb./sq. ft.)	132 / 12.5′ 4.64	111 14.4 4.68	21 7.4 4.43	99 16.3 5.19	33 7.4 2.99
Av./holding ('000 sq. ft.)	12.5	14.4	7.4	16.3	7.4
Av./holding ('000 sq. ft.) Av. yield p.a. (lb./sq. ft.)	12.5′ 4.64	14.4 4.68	7.4 4.43	16.3 5.19	7.4 2.99
Av. holding ('000 sq. ft.) Av. yield p.a. (lb./sq. ft.) Av. no. of crops p.a Cropped Area (acres) Av. holding ('000 sq. ft.)	12.5' 4.64 3.26 430 40.8	14.4 4.68 3.23 360 46.5	7.4 4.43 3.41 70 25.1	16.3 5.19 3.56 353 58.2	7.4 2.99 2.35 77 17.2
Av. holding ('000 sq. ft.) Av. yield p.a. (lb./sq. ft.) Av. no. of crops p.a Cropped Area (acres) Av./holding ('000 sq. ft.) Av./yield/crop (lb./sq. ft.) Av. Spawn Rate (sq. ft./carton)	12.5' 4.64 3.26 430 40.8 1.42 28.8	14.4 4.68 3.23 360 46.5 1.45	7.4 4.43 3.41 70 25.1 1.30 33.0	16.3 5.19 3.56 353 58.2 1.46	7.4 2.99 2.35 77 17.2 1.28 33.4
Av. holding ('000 sq. ft.) Av. yield p.a. (lb./sq. ft.) Av. no. of crops p.a Cropped Area (acres) Av./holding ('000 sq. ft.) Av./yield/crop (lb./sq. ft.) Av. Spawn Rate (sq. ft./carton) Av. Spawn Yield (lb./carton)	12.5' 4.64 3.26 430 40.8 1.42 28.8 41.1	14.4 4.68 3.23 360 46.5 1.45 28.0 40.7	7.4 4.43 3.41 70 25.1 1.30 33.0 43.2	16.3 5.19 3.56 353 58.2 1.46 27.8 40.7	7.4 2.99 2.35 77 17.2 1.28 33.4 42.7
Av. holding ('000 sq. ft.) Av. yield p.a. (lb./sq. ft.) Av. no. of crops p.a Cropped Area (acres) Av./holding ('000 sq. ft.) Av./yield/crop (lb./sq. ft.) Av. Spawn Rate (sq. ft./carton) Av. Spawn Yield (lb./carton) 1959/60 No. of producing holdings Output or Sales (m.lb.) (Forecast) Output or Sales (%)	12.59 4.64 3.26 430 40.8 1.42 28.8 41.1 468 32.8 100.0	14.4 4.68 3.23 360 46.5 1.45 28.0 40.7	7.4 4.43 3.41 70 25.1 1.30 33.0 43.2 129	16.3 5.19 3.56 3.53 58.2 1.46 27.8 40.7	7.4 2.99 2.35 77 17.2 1.28 33.4 42.7
Av. holding ('000 sq. ft.) Av. yield p.a. (lb./sq. ft.) Av. no. of crops p.a Cropped Area (acres) Av./holding ('000 sq. ft.) Av./yield/crop (lb./sq. ft.) Av./yield/crop (lb./sq. ft.) Av. Spawn Rate (sq. ft./carton) Av. Spawn Yield (lb./carton) 1959/60 No. of producing holdings Output or Sales (%) Av. output per holding ('000 lb.) Output-per-Holding Groups	12.59 4.64 3.26 430 40.8 1.42 28.8 41.1 468 32.8 100.0 70.1 No. % of Total Hidgs. Prod.	14.4 4.68 3.23 360 46.5 1.45 28.0 40.7 339 28.0 85.2 82.5 No. % of Total Hidgs. Prod.	7.4 4.43 3.41 70 25.1 1.30 33.0 43.2 129 4.8 14.8 37.6 No. of Total	16.3 5.19 3.56 3.53 58.2 1.46 27.8 40.7 272 27.4 83.5 100.7 No. of Total Hldgs. Prod.	7.4 2.99 2.35 77 17.2 1.28 33.4 42.7 196 5.4 16.5 27.6 No. of Total Hidgs. Prod.
Av./holding ('000 sq. ft.) Av. yield p.a. (lb./sq. ft.) Av. no. of crops p.a Cropped Area (acres) Av./holding ('000 sq. ft.) Av./yield/crop (lb./sq. ft.) Av./yield/crop (lb./sq. ft.) Av. Spawn Rate (sq. ft./carton) Av. Spawn Yield (lb./carton) 1959/60 No. of producing holdings Output or Sales (%) Av. output per holding ('000 lb.) Output-per-Holding Groups lb. per annum	12.59 4.64 3.26 430 40.8 1.42 28.8 41.1 468 32.8 100.0 70.1 No. % of Total Hidgs. Prod.	14.4 4.68 3.23 360 46.5 1.45 28.0 40.7 339 28.0 85.2 82.5 No. % of Total Hildgs. Prod.	7.4 4.43 3.41 70 25.1 1.30 33.0 43.2 129 4.8 14.8 37.6 No. of Total Hidgs. Prod. 101 14 4.1	16.3 5.19 3.56 3.53 58.2 1.46 27.8 40.7 272 27.4 83.5 100.7 No. of Total Hidgs. Prod.	7.4 2.99 2.35 77 17.2 1.28 33.4 42.7 196 5.4 16.5 27.6 No. of Total Hidgs. Prod.
Av./holding ('000 sq. ft.) Av. yield p.a. (lb./sq. ft.) Av. no. of crops p.a. Cropped Area (acres) Av./holding ('000 sq. ft.) Av./yield/crop (lb./sq. ft.) Av. Spawn Rate (sq. ft./carton) Av. Spawn Yield (lb./carton) 1959/60 No. of producing holdings Output or Sales (%) Av. output or Sales (%) Av. output per holding ('000 lb.) Output-per-Holding Groups lb. per annum Up to 49,999	12.59 4.64 3.26 430 40.8 1.42 28.8 41.1 468 32.8 100.0 70.1 No. % of Total Hidgs. Prod. 333 70 14.0	14.4 4.68 3.23 360 46.5 1.45 28.0 40.7 339 28.0 85.2 82.5 No. % of Total Hidgs. Prod. 232 11.7 56 11.0	7.4 4.43 3.41 70 25.1 1.30 33.0 43.2 129 4.8 14.8 37.6 No. % of Hidgs. Prod. 101 14 3.0	16.3 5.19 3.56 3.53 58.2 1.46 27.8 40.7 272 27.4 83.5 100.7 No. of Total Hidgs. Prod. 163 9.2 57 11.6	7.4 2.99 2.35 77 17.2 1.28 33.4 42.7 196 5.4 16.5 27.6 No. of Hidgs. Total Prod. 170 13 2.4
Av./holding ('000 sq. ft.) Av. yield p.a. (lb./sq. ft.) Av. no. of crops p.a. Cropped Area (acres) Av./holding ('000 sq. ft.) Av./yield/crop (lb./sq. ft.) Av. Spawn Rate (sq. ft./carton) Av. Spawn Yield (lb./carton) 1959/60 No. of producing holdings Output or Sales (m.lb.) (Forecast) Output or Sales (%) Av. output per holding ('000 lb.) Output-per-Holding Groups lb. per annum Up to 49,999 50,000—99,999	12.59 4.64 3.26 430 40.8 1.42 28.8 41.1 468 32.8 100.0 70.1 No. % of Total Hidgs. Prod. 333 70 14.0 43 17.4	14.4 4.68 3.23 360 46.5 1.45 28.0 40.7 339 28.0 85.2 82.5 No. % of Total Hidgs. Prod. 232 11.7 56 11.0 33 13.5	7.4 4.43 3.41 70 25.1 1.30 33.0 43.2 129 4.8 14.8 37.6 No. % of Total Hidgs. Prod. 101 4.1 14 3.0 10 3.9	16.3 5.19 3.56 3.53 58.2 1.46 27.8 40.7 272 27.4 83.5 100.7 No. % of Total Hidgs. Prod. 163 9.2 57 11.6 34 13.9	7.4 2.99 2.35 77 17.2 1.28 33.4 42.7 196 5.4 16.5 27.6 No. of Total Prod. 170 13 2.4 3.5
Av./holding ('000 sq. ft.) Av. yield p.a. (lb./sq. ft.) Av. no. of crops p.a Cropped Area (acres) Av./holding ('000 sq. ft.) Av./yield/crop (lb./sq. ft.) Av./spawn Rate (sq. ft./carton) Av. Spawn Rate (sq. ft./carton) 1959/60 No. of producing holdings Output or Sales (m.lb.) (Forecast) Output or Sales (%) Av. output per holding ('000 lb.) Output-per-Holding Groups lb. per annum Up to 49,999 50,000 —99,999 100,000—199,999	12.59 4.64 3.26 430 40.8 1.42 28.8 41.1 468 32.8 100.0 70.1 No. % of Total Hidgs. Prod. 333 15.8 70 14.0 43 17.4 22 52.8	14.4 4.68 3.23 360 46.5 1.45 28.0 40.7 339 28.0 85.2 82.5 No. % of Total Hidgs. Prod. 232 11.7 56 11.0 33 13.5 18 49.0	7.4 4.43 3.41 70 25.1 1.30 33.0 43.2 129 4.8 14.8 37.6 No. of Total Hidgs. Prod. 101 4.1 14 3.0 10 3.9 4 3.8	16.3 5.19 3.56 3.53 58.2 1.46 27.8 40.7 272 27.4 83.5 100.7 No. of Total Hldgs. Prod. 163 9.2 57 11.6 34 13.9 18 48.8	7.4 2.99 2.35 77 17.2 1.28 33.4 42.7 196 5.4 16.5 27.6 No. of Total Hldgs. Prod. 170 6.6 13 2.4 9 3.5 4 4.0
Av./holding ('000 sq. ft.) Av. yield p.a. (lb/sq. ft.) Av. no. of crops p.a Cropped Area (acres) Av./holding ('000 sq. ft.) Av./yield/crop (lb/sq. ft.) Av./spawn Rate (sq. ft./carton) Av. Spawn Yield (lb./carton) 1959/60 No. of producing holdings Output or Sales (m.lb.) (Forecast) Output or Sales (%) Av. output per holding ('000 lb.) Output-per-Holding Groups lb. per annum Up to 49,999 50,000 —99,999 100,000—199,999	12.59 4.64 3.26 430 40.8 1.42 28.8 41.1 468 32.8 100.0 70.1 No. % of Total Hidgs. Prod. 333 15.8 70 14.0 43 17.4 22 52.8	14.4 4.68 3.23 360 46.5 1.45 28.0 40.7 339 28.0 85.2 82.5 No. % of Total Hidgs. Prod. 232 11.7 56 11.0 33 13.5 18 49.0	7.4 4.43 3.41 70 25.1 1.30 33.0 43.2 129 4.8 14.8 37.6 Total Hidgs. Prod. 101 4.1 14 3.0 10 3.9 4 3.8	16.3 5.19 3.56 3.53 58.2 1.46 27.8 40.7 272 27.4 83.5 100.7 No. % of Total Hidgs. Total Hidgs. 11.6 34 13.9	7.4 2.99 2.35 77 17.2 1.28 33.4 42.7 196 5.4 16.5 27.6 No. of Total Hidgs. Prod. 170 6.6 13 2.4 3.5 4.0

Notes: (1) The Mushroom Growers' Association Membership details are as at mid-November, 1959. It is understood that the MGA membership has increased since that date.

425

No. of Holdings, Production, Yields, et

NO. OF HOLDIN	GS			
NO. OF HOLDIN		0—4,999	5,000—9,999	10,00019,99
All Holdings		96	62	78
Agricultural Holdings Non-Agricultural Holdings		70 26	39 23	53 25
MGA Members' Holdings Non-MGA Holdings		26 70	28 34	45 33
Total Production in Groups		'000 lb.	'000 lb.	'000 lb.
All Holdings		202	448	1,100
Agricultural Holdings Non-Agricultural Holdings		163 40	285 163	776 323
MGA Members' Holdings Non-MGA Holdings		58 145	198 250	626 474
Per Cent of Group Product	ion	%	%	%
All Holdings		0.8	1.7	4.1
Agricultural Holdings Non-Agricultural Holdings	• • • • • • • • • • • • • • • • • • • •	0.7 1.0	1.3 4.1	3.4 8.1
MGA Members' Holdings Non-MGA Holdings		0.3 3.4	0.9 5.8	2.8 11.0
Yield per Crop; Lb. per S Cropping Area		lb./Sq. Ft.	Lb./Sq. Ft.	Lb./Sq. Ft.
All Holdings		0.74	0.92	1.18
Agricultural Holdings Non-Agricultural Holdings		0.85 0.47	1.00 0.80	1.21 1.11
MGA Members' Holdings Non-MGA Holdings		0.52 0.88	0.74 1.14	1.09 1.33
Average No. of Crops Per	Annum	No. p.a.	No. p.a.	No. p.a.
All Holdings		1.60	1.87	1.97
Agricultural Holdings Non-Agricultural Holdings		1.50 1.91	1.56 2.59	1.98 1.93
MGA Members' Holdings Non-MGA Holdings		2.36 1.32	2.67 1.37	2.41 1.52
Yield Per Annum; Lb. Per S Bedding Space		Lb./Sq. Ft.	Lb./Sq. Ft.	Lb./Sq. Ft.
All Holdings		1.18	1.72	2.32
Agricultural Holdings Non-Agricultural Holdings	• • • • •	1.28 0.91	1.56 2.07	2.39 2.15
MGA Members' Holdings Non-MGA Holdings		1.23 · 1.16	1.96 1.56	2.61 2.02

3 for 1958/59 Output-per-Holding Groups 1958/59 ANNUA

101 1730/37 0	19		OUTPUT (Lb.)	
20,000—29,999	30,000—49,999	50,000—99,999	100,000-199,999	200,000& over	TOTAL
52	58	61	34	18	459
40 12	48 10	45 16	~ 27 7	15 3	337 122
30 22	39 19	52 9	29 5	15 3	264 195
'000 lb.	'000 lb.	'000 lb.	'000 lb.	'000 lb.	'000 lb.
1,227	2,170	3,991	4.461	13,060	26,659
949 277	1,819 351	2,895 1,096	3,519 942	12,277 784	22,683 3,976
704 523	1,472 698	3,361 630	3,771 690	12,179 881	22,369 4,290
%	%	%	%	%	%
4.6	8.1	15.0	16.7	49.0	100.0
4.2 7.0	8.0 8.8	12.8 27.6	15.5 23.7	54.1 19.7	100.0 100.0
3.1 12.2	6.6 16.3	15.0 14.7	16.9 16.1	54.4 20.5	100.0 100.0
Lb./Sq. Ft.	Lb./Sq. Ft.	Lb./Sq. Ft.	Lb./Sq. Ft.	Lb./Sq. Ft.	Lb./Sq. Ft.
1.20	1.25	1.48	1.43	1.55	1.42
1.24 1.11	1.24 1.34	1.49 1.45	1.46 1.32	1.54 1.56	1.45 1.30
1.23 1.16	1.25 1.26	1.49 1.39	1.46 1.29	1.56 1.39	1.46 1.28
No. p.a.	No. p.a.	No. p.a.	No. p.a.	No. p.a.	No. p.a.
2.12	3.08	3.03	3.43	4.24	3.26
1.93 3.02	2.97 3.88	2.82 3.78	3.20 4.50	4.23 4.35	3.23 3.41
2.37 1.87	3.43 2.53	3.19 2.44	3.38 3.64	4.18 5.15	3.56 2.25
Lb./Sq. Ft.	Lb./Sq. Ft.	Lb./Sq. Ft.	Lb./Sq. Ft.	Lb./Sq. Ft.	Lb./Sq. Ft.
2.55	3.85	4.48	4.90	6.54	4.64
2.39 3.25	3.67 5.21	4.20 5.48	4.68 5.92	6.53 6.80	4.68 4.43
2.93 2.18	4.28 3.18	4.77 3.40	4.94 4.69	6.50 7.16	5.19 2.99

TABLE 4

1958/59 Frequency Distributions: Nos. of Agricultural and Non-Agricultural Holdings

	Size of Holding Groups: Acres													
	1 Ac and un		11- 43	5- 9 ³ / ₄	10- 14 ³	15- 19≹	20- 29 ³ / ₄	30- 393	40- 493	50- 993	100 A		Total	
Agricultural Holdings Non-Agricultural Holdings	122	2	137	77	33	17	18	15	5	12	23	3	337 122	
All Holdings	122	2	137	77	33	17	18	15	5	12	23	3	459	
	Area of Bedding Space per Holding Groups: Sq. Ft.													
	999 and un		1,000- 1,999	2,000-2,999	3,000-	4,000- 4,999	5,000- 9,999	10,000	15,000 19,999	20,000 29,999	30,000 39,999	40,000 & over	Total	
Agricultural Holdings Non-Agricultural Holdings	13		34 11	23 14	27 7	29 15	82 32	56 17	26 6	23 5	10 5	14	337 122	
All Holdings	22		45	37	34	44	114	73	32	28	15	15	459	
	(rop	ping A	ea Yiel	d Grou	ps: Lb.	of Mu	shroom	s per S	q. Ft.	per Cro	р		
	0.4 and u		0.50- 0.74	0.75- 0.99	1.00-	1.25- 1.49	1.50- 1.74	1.75-	2.00- 2.24	2.25- 2.49	and and	.50 over	Total	
Agricultural Holdings Non-Agricultural Holdings	15 9		20 9	43 20	70 30	44 16	72 24	27	22 6	8 2	10	5	337 122	
All Holdings	24	-	29	63	100	60	96	28	28	10	2		459	
	No. of Crops per Year Groups:													
			9 Crop d unde		2.00- 2.99		3.00- 3.99 4.			5 Crop and ov				
Agricultural Holdings Non-Agricultural Holdings	::		120 78 30 19			63 31	39 28		37 14		337 122			
All Holdings			150	97 94			94		67		51			
	1	В	dding	Space Y	ield Gi	oups: 1	b. of M	1ushroo	ms per	Sq. Ft	per Y	ear		
	0.99 and un	der	1.00- 1.99	2.00-	3.00- 3.99	4.00- 4.99	5.00-	6.00- 6.99	7.00- 7.99	8.00- 8.99	9.00- 9.99	10 lb. & over	Total	
Agricultural Holdings Non-Agricultural Holdings	25 13		73 24	70 16	49 20	49 15	31 13	12	17 6	5 2	3 2	3	337 122	
All Holdings	38		97	86	69	64	44	22	23	7	5	4	459	
			Spav	vn Yiele	d Group	s: lb.	of Mus	hrooms	per Ca	rton				
	9,99 and un		10- 19.99	20- 29.99	30- 39.99	40- 49.99	50- 59.99	60- 69.99	70- 79.99	80- 89.99	90- 99.99	100 lb. & over		
Agricultural Holdings Non-Agricultural Holdings	4 7		22 7	43 17	81 23	54 20	42 16	27 14	18	17 7	9 3	20	337 122	
All Holdings	11		29	60	104	74	58	41	23	24	12	23	459	
		S	pawn I	Rate Gr	oups: S	g. Ft.	of Crop	pping A	rea per	Cartor	1	1	1	
	9.99 and und	der	10- 19.99	20- 29.99	30- 39.99	40- 49.99	50- 59.99	60- 69.99	70- 79.99	80- 89.99	90- 99.99	100s.ft & over		
Agricultural Holdings Non-Agricultural Holdings	2 2		13	113	102 27	44 21	29 18	9 5	7	3	1	14	337 122	
All Holdings	4		21	147	129	65	47	14	7	4	2	19	459	

TABLE 4A

1958/59 Frequency Distributions: Nos. of MGA Members' and Non-MGA Holdings

					Size of	f Holdi	ng Grou	ips: Aci	res				
	1 Ac		11- 43	5- 9½	10- 143	15- 19‡	20- 293	30- 393	40- 49 ³ / ₄	50- 993	100 a		Total
MGA Members' Holdings Non-MGA Holdings	82 40		75 62	39 38	13 20	10 7	10 8	9	2 3	11 1	13 10		264 195
All Holdings	122		137	77	33	17	18	15	5	12	23	3	459
			Arc	ea of B	edding	Space 1	oer Hol	ding G	roups: S	Sq. Ft.			
	999 and un		1,000- 1,999	2,000- 2,999	3,000- 3,999	4,000- 4,999		10,000 14,999				40,000 & over	
MGA Members' Holdings Non-MGA Holdings	3 19		16 29	20 17	17 17	26 18	68 46	48 25	24	18 10	13 2	11 4	264 195
All Holdings	22		45	37	34	44	114	73	32	28	15	15	459
		Cro	pping 2	Area Yi	eld Gro	oups: L	b. of N	[ushroo	ms per	Sq. Ft.	per C	гор	
	0.49 and u		0.50- 0.74	0.75- 0.99	1.00- 1.24	1.25- 1.49	1.50- 1.74	1.75- 1.99	2.00- 2.24	2.25- 2.49	and		Total
MGA Members' Holdings Non-MGA Holdings	13		15 14	36 27	55 45	38 22	54 42	18 10	14 14	7 3	1	7	264 195
All Holdings	24		29	63	100	60	96	28	28	10	2	1	459
					No	o. of C	rops pe	Year	Groups	:			
			9 Crop d unde		2.00- 2.99		3.00- 3.99		1.00- 1.99		Crops l over	T	otal
MGA Members' Holdings Non-MGA Holdings			39 / 111		55 42		76 18		52 15		42 9		64 195
All Holdings			150	50 97 94				67		51	4	159	
		Be	dding S	pace Y	ield Gr	oups: L	b. of M	Aushroo	ms per	Sq. Ft	. per 3	ear	
	0.99 and un		1.00- 1.99	2.00- 2.99	3.00- 3.99	4.00- 4.99	5.00- 5.99	6.00- 6.99	7.00- 7.99	8.00- 8.99	9.00- 9.99	10 lb. & over	
MGA Members' Holdings Non-MGA Holdings	10 28		30 67	44 42	46 23	42 22	37 7	19 3	20 3	7	5	4	264 195
All Holdings	38		97	86	69	64	44	22	23	7	5	4	459
			Sp	awn Yi	eld Gro	ups: Li	o. of M	lushroor	ns per	Carton			
	9,99 and un		10- 19.99	20- 29.99	30- 39.99	40- 49.99	50- 59.99	60- 69.99	70- 79.99	80- 89.99	90-99.99	100 lb & over	Total
MGA Members' Holdings Non-MGA Holdings	8 3		12 17	31 29	62 42	40 34	38 20	24 17	18 5	14 10	5 7	12 11	264 195
All Holdings	11		29	60	104	74	58	41	23	24	12	23	459
			S	pawn R	ate Gr	oups: S	o. Ft.	of Crop	ping A	rea per	Carton		
	9.99 and ur		10- 19.99	20- 29.99	30- 39.99	40-49.99	50- 59.99	60- 69.99	70- 79.99	80- 89.99	90- 99.99	100s.ft & over	
MGA Members' Holdings Non-MGA Holdings	3		11 10	82 65	79 50	35 30	34	4 10	3 4	1 3	2	10 9	264 195
All Holdings	4		21	147	129	65	47	14	7	4	2	19	459

PINHEADS

Flushed up at Weston-Super-Mare

- 238. Winning Mushroom Competition Cups is very laudable and praiseworthy. The other day I saw some disgracefully blotched and diseased mushrooms. We at Brayton, who neither grade nor compete for Cups, would have thrown such rubbish into the waste bins. Who sent them? One of our cup winners!
- 239. Norman Cooper, in his Weston lecture, claimed he had cured La France (and by inference all other diseases) with a certain product. *Others have claimed at various times that they cleared the the trouble in different ways —steaming out, SDNOC, etc. It couldn't be that La France departed of its own free will?—just as other diseases and flies gradually fade out because the overall conditions of the area or country no longer favour them. Of course it could.
- 240. 1960 has been a good growing year. No serious general disease, fewer flies than usual, a well-harvested 1959 straw which automatically ensured better composts. These points make an interesting commentary on the last item. They may also explain the impression I had at Weston of general over-confidence. At previous conferences the moan has been, "We don't understand why so and so happens to us..." At Weston the triumphant strain was, "We know most of the answers now..."
- 241. Another odd impression. While the moans of other years were invariably accompanied by blatant demonstrations of junketry and jollification, the current triumph has given birth to a dull sobriety which even the acid-dry humour of Reggie Duthy was incapable of dispersing. I think I prefer mushroom growers when they are in trouble; they're much more lively and interesting that way.
- 242. If 1960 has been a good year, leaving everyone sad and miserable I think we shall see a return to normal merriment with 1961, unless the prognostications of one grower materialize to upset my forecast. With the confidence of a good year behind him he said, "We have learned how to handle poor straw; there is no longer any difficulty." Wait and see.
- 243. Also heard at Weston: "Mushroom growing is easy. We know what to do and we do it".
- 244. The millenium is here! No more will flies and maggots interfere with our crops if we keep them at bay during the spawning to picking period. So hints Hussey. If, after eliminating them in this manner, they should appear in the picker's hair, eyes, and noses, they are merely there for our amusement and sport. We may "shoot" them down. But remember, chaps, it's not done to shoot a sitting bird.
- 245. According to Fawcett, at Weston, hard fuel is easier and cheaper to obtain in the North than in the South. During the shortage period a few years ago when we at Brayton (Yorkshire) were down to the last 4 cwts., a Southern grower told me his yard was overflowing with coal

^{*} Mr. Cooper claimed to have stopped the Wet Rotting of the dead mushrooms : Ed.

and anthracite and he didn't know what to do with it. A preliminary explanation is that we in arctic Yorkshire need to burn more fuel than the sun-drenched Southerner. I await the *real* explanation.

- 246. Has anyone ever wondered what happens to straw that lies out unharvested for weeks on end, wet, rotting and blackening? Could it gather on its decomposing length the spores of undesirable fungi (diseases) which may later turn up in our crops as Brown disease, La France, Blotch or what have you? I gather that some form of penicillin mould can develop in these conditions. Why shouldn't others more harmful do so? Is there any way in which these contaminated straws could be washed clean, even after passing through the stable, before we compost them?
- 247. "Massed pinheading"—a scourge threatening apparently only one or two growers, and consisting of trays completely full of tiny undying yet unexpanding pinheads, thousands to the sq. inch—had several explanations but no hint of any overcoming measure. A new form of infantile paralysis!
- 248. One of the best tests of a grower's honesty about his size and cropping has always been the numbers of pickers and packers he employs. If a man tells you he has 20,000 sq. ft. and averages 2.5 five times a year with a staff of five men and two girl pickers, he is way off the truth and a fool if he expects you to believe it. Nevertheless one has heard just this sort of thing many times in the past and it left one with a sort of hopeless wish that one day everyone would be strictly honest about his facts and figures, his successes and his failures. Only this way can one expect to get useful information, comparisons, and so on. It does seem to me, however, that this hopeless wish is on the verge of being realised. A current, new, and increasingly applied method of reference is the number of sq. ft. laid per week. If this figure is fairly consistent, or is averaged, divide it into the average lb. of mushrooms picked per week, and you get that man's average yield per sq. ft. (over a given period, of course). This will not tell you whether the man is on 4" trays or 7" beds, nor whether he is cropping 4 or 6 times a year . . . it doesn't matter much anyway . . . but it does give a pretty good measure of his honesty. If the sum works out right, he's telling the truth. If it doesn't, then everything else he tells you might be stretched too. This brings us back to pickers. Patterson, that very sound man, is dead right. If a farm is doing well, half or more than half of the staff should be pickers and packers, and operating full time at that. With how many of us is this so? And I said pickers, not tea makers.
- 249. The mushroom world is hiving itself off into schools—or was at Weston. There's a school of golfers; a school of large growers (100,000—200,000 men); a school of tradesmen; a school of spawn makers; a school of show competitors and Cup winners; a school of tray growers; and of course a double whisky school. With the sudden advent of "massed pinheading" I thought at last we were to have a "Pinhead" school, but the fellow who said "I occasionally read your Pinheads and rarely find it worthwhile" soon put an end to that.



RUSSELL STREET CHAMBERS — BINGLEY
YORKSHIRE - Tel. BINGLEY 4383

SOLE DISTRIBUTORS FOR

PINKERTONS PROLIFIC PURE CULTURE SPAWN

MANURE OR GRAIN

EXCELLENT DELIVERY

FOR GOODNESS SAKE

use

SHIRLEY LAKE

THE 'MUST' IN LIQUID NUTRIENTS

At the Conference this time, The lectures were fine, They continued most of the day. There is such a lot of work, That no one can shirk; It's a CREDIT TO THE MGA.

FOOD FAIR - OLYMPIA 1960

The MGA stand formed a small part of the British Farm Produce Council's exhibit at the Food Fair, which was open to the public from the 1st September until 17th September.

The stand consisted of a display, showing chips of mushrooms and pre-packed mushrooms, capped by a large artificial mushroom, 3 feet in diameter. The counter across the front of the stand was used for the sale of $\frac{1}{2}$ lb. packs of fresh mushrooms.

Two girls were obtained from an agency to pack and sell the mushrooms and during the whole exhibition 6,500 packs were sold. The packs were waxed punnets, covered with a Cellulose Acetate film, which British Celanese Ltd. kindly provided. This film was heat-sealed and the dab plate was provided for our use during the exhibition by A. Warne & Co. Ltd., Queen Victoria Street, London.

"Don't Peel" slips were put into every pack and this certainly helped to increase trade. Recipe leaflets were always available.

A cookery demonstration theatre formed part of the complex British Farm Produce Council stand and here experienced demonstrators gave 6 half-hour demonstrations each day (6,750 total audience), using all the products in the exhibit including mushrooms.

31st August, was Press Day and many of the Women Journalists who have attended MGA functions came to visit our stand. The Fair was formally opened by Mr. Derick Heathcoat-Amory, who paid us a visit. Other visitors included Mr. Christopher Soames, Minister of Agriculture, and Mr. Ernest Marples, Minister of Transport who was accompanied by Mrs. Marples. As reported in the *Daily Express*, on 6th September, Mr. Marples and his wife sampled raw mushrooms when they visited the MGA stand.



Mr. MARPLES (Minister of Transport) and Mrs. MARPLES visit the Mushroom Growers' Association Stand and try raw mushrooms.



Made with Mushroom men in mind!

For Trays, Bed Boards, and Growing Rooms, Pepsan combines detergent, disinfectant and deodoriser to give "3D" protection.

Why it will pay you to try NEW PEPSAN

because Pepsan cleans first, so sterilises all the more effectively

because it instantly kills all undesirable fungi and bacteria

because mushroom growth is increased by its use

because there is no better steriliser

because it is non-poisonous

because it is safe to skin and harmless in use

Pepsan — the scientific sterilizer that combines its own cleanser Obtainable from your local Agricultural Merchant in case of difficulty er for FREE LEAFLET write ta B.E.G. (Sales) Ltd. New Ferry, Birkenhead, Cheshire



IMPROVED CROPPING AS A RESULT OF WASHING DOWN GROWING HOUSES WITH PEPSAN

By Hugh Claxton (Cheshire)

We operate on an intensive six week cropping period on the tray system and after a time we found that yield was falling off and the time from casing to first pick increased from 21 to 28 days.

We were told by the experts that "cooking out" after cropping would be the only way to put our houses in order, so to speak.

However, we were unable to adopt the cooking out procedure without investing in extra steam-raising plant and even then there would be a problem as our growing houses have common dividing walls through which heat would pass thus endangering growing crops in the houses next door.

We put a lot of thought in on this subject, as many others have, and we were eventually forced into a conclusion which seems to have been proved correct. Our conclusion was that this need to cook out does not exist at all.

We assumed that most growers used some liquid sterilizing agent to wash down with before having to resort to the cooking out procedure and in our experience we found that virtually all the agents recommended and used contained a sterilizing agent put in by the manufacturer to give the agent a long lasting, residual quality as a bactericide/fungicide/insecticide.

The question of a possible residual build up having some harmful effect on crops worried us and, with this theory in mind, we looked for an effective sterilizing agent with no residual effects incorporated and as luck would have it we were approached by The British Extracting Co. (Sales) Ltd., of Bromborough, Cheshire, and invited to try out their new product:—' Pepsan'.

This preparation is in powder form and is readily soluble in water. It incorporates a wetting agent with a sanitiser which is also a useful bactericide, fungicide and insecticide.

In powder form or in solution the product is quite safe to handle and no protective clothing is required when using it but when made into a solution it should be used immediately as there is no residual effect and its efficiency will go off within a few hours.

Our growing houses are now washed down with Pepsan in a 2% solution (8 oz. per $2\frac{1}{2}$ gal. bucket). The solution is heated to 140° F. by introducing live steam into the bucket via a rubber hose. The hot solution is then sprayed liberally onto the ceiling, walls and floors using a stirrup pump. We recommend the use of Martindale masks during this procedure to avoid inhaling the mist.

We use 40 gal. of solution to wash down one of our houses measuring 60×11 ft. or 8 lb. Pepsan costing only 17/- per house.

18 days. 1.82 lb.

We have now grown four crops since this discovery with the following results:—

From now on our target will be $5\frac{1}{2}$ crops per year per house and a yield of $9\frac{1}{4}$ lb. per sq. ft. per annum.

We also use Pepsan for dipping trays and for this we use a $1\frac{120}{9}$ solution cold. As there is no residual effect, trays may be dipped the day before filling and there is no danger from close-stacking trays in the pasteurizing house or in the spawn room. The trays empty out clean after cropping and a further dipping in the solution brings off all traces of compost, etc. We have also found Pepsan very useful for cleaning concrete floors, compost yards and supporting frames, etc.

999

PRESENTED TO H.M. THE QUEEN AND THE DUKE OF EDINBURGH

When H.M. The Queen and the Duke of Edinburgh visited Kinross, Scotland, on Monday 10th October, among those presented to the Royal couple were Mr. and Mrs. J. Beveridge of Kinross.

Mr. Beveridge has been a valued member of the MGA since 1949, and produces mushrooms on a large scale at Kinross.

Master Stuart Smith, son of the Provost, presented The Queen with four cashmere jerseys, linen towels and a basket of mushrooms.

In conversation with Mr. Beveridge, The Queen enquired whether, in mushroom growing, anything went wrong at times to which Mr. Beveridge replied "Yes, only too often". The Duke was also much interested in the mushrooms and congratulated Mr. Beveridge on their appearance.

MGA members are aware that mushrooms are grown both at Windsor Castle and at Sandringham.

MUSHROOM TRAYS

WE HAVE REGULAR SUPPLIES OF

DANISH AND NORWEGIAN FISH TRAYS

FOR ALL YOUR REQUIREMENTS

RODGERS

4, SALISBURY ROW - LONDON S.E. 17

PHONE . RODNEY 3640

The CULVERWELL Manure Jurner



Our present range of three different models incorporates many years experience of manufacturing these specialised machines.

In use throughout the British Isles and many other countries.

Please send for details

E.O. CULVERWELL Ltd.

MALLING WORKS, LEWES, SUSSEX

Telephones: LEWES 637 (5 lines)

MOUNT (Pure Culture)

IN 6 SELECTED STRAINS on GRAIN and MANURE



Yields from MOUNT WHITE

SHELVES 4 LBS. PER SQ. FT. **TRAYS** 3 LBS. PER SQ. FT.

For Good Size, Good Colour, Good Shape, you cannot do better than to spawn with **MOUNT WHITE**, and only Quality Produce fetches the Best Prices!

Write for free booklet to Sole Distributors:

J. E. R. SIMONS LTD. HARLOW ESSEX

Telephone HARLOW 222, 223 & 224

MUSHROOM SPAWN

For Control of PHORID, always dust with



14 lb. Polythene Lined Paper Bags and 56 lb. kegs

FROM:

J. E. R. SIMONS LTD. HARLOW ESSEX

Telegrams SIMONS, HARLOW

BURGESS BOILER FOR EIRE

BURGESS WERE SELECTED TO DESIGN AND INSTALL THE HEATING PLANT AT THE NEW EIRE HORTICULTURAL RESEARCH STATION AT KINSALEY, DUBLIN. This is the first Horticultural Research Station to be constructed in Eire and it will be among the finest in Europe, and with the most advanced Mushroom Research Houses

SPECIAL CREDIT ARRANGEMENTS CAN BE MADE TO SUIT CLIENTS' INDIVIDUAL REQUIREMENTS



One of the new 4 Million B.T.U. 55 PSI Steam Burgess Boilers ready for shipment to Dublin for installation at Kinsaley.



Boiler Makers Acetylene and Electric Welder

Member of:

The Association of Heating and Ventilating Engineers, Electrical Contractors' Association

Makers of:

Burnell Forced Draught Equipment, Oil Storage Tanks, Calorifiers, Chimneys.
Horacultural and Industrial Steel Boilers. All Equipment for Glasshouse Heating, Mist Propagation Equipment.

BROXBOURNE HERTS.

Tel.: Hoddesdon 2305

LEITH EDINBURGH Tel.: Leith 31056 BURGESS & Co. (Engineers) LTD. BRACKNELL, BERKS.

Tel.: Bracknell 1341



Whilst entries for the competition classes were not so high as last year the general standard was voted the best ever. Here, with the competition mushrooms in the foreground, are the cup winners. L. to R.: G. W. Baker (Broadham Produce Co. Ltd., Oxted, Surrey), R. J. McBriar (Overdale, Belfast), Robt. Patterson and F. Patterson of the Monlough Food Production Co. Ltd. (Ballygowan, Belfast).

WESTON-SUPER-MARE CONFERENCE

With a total attendance, including the ladies, of about 220 the MGA Conference at Weston-Super-Mare, from 10th October, until the morning of 13th October, chalked up the best attendance ever.

That the Conference was a success is beyond doubt and beyond doubt too is the fact that the papers delivered on a wide variety of aspects of the mushroom industry were, in themselves, of a very high standard with the proceedings, following the successful "get together" on the night of Monday, 10th October, getting off to a good start with the first paper delivered on Tuesday morning by Mr. Norman Cooper of Kimcote, Rugby, a former member of the MGA Executive Committee.

Conference papers apart, the Monlough Food Production Co. Ltd., of Ballygowan, Belfast, administered something of a shock in the mushroom competitions by carrying off no fewer than five of the eight available cups with Mr. R. J. McBriar from Saintfield, Overdale, Belfast, aiding and abetting this "invasion" by securing one of the remaining three cups. Mcnlough were runners-up in the two other classes in which the Broadham Produce Co. Ltd., of Oxted, Surrey, put up a tremendous fight to take two cups and only narrowly failing to retain the cups they held in three other classes in which they finished runners-up.

ACTUAL RECORDS

IN LBS. PER SQUARE FOOT

ON MODERN TRAY FARM USING STANDARD MANURE IN SAME HOUSE

> 2.47 1.57 2.33 2.20 2.08 2.55 1.91 2.36

> > AND THEN

3.33 3.04 3.21

WHEN A CHANGE WAS MADE TO

'ABUNDANCE No. I'

No. I Suitable for Synthetic or Boosting

No. 3 An excellent additive for racing manure

No. 3 Specially blended to break down

SPECIAL MIX tough Cappelle Straw

WHY GAMBLE WITH YOUR **COMPOSTS?**



THIS SIGN IS YOUR **GUARANTFF**

BRADFORD FERTILIZER

CO. LTD.

BRADFORD, YORKS. Bradford 41288

Although the competition entries were down this year everyone agreed that quality had never been higher and although each of the eight classes was judged by a separate panel of three non-competing growers or their wives about an hour and a half elapsed before all the judging was finished.

In a statement which appeared in the Belfast News-Letter of 12th October, Mr. R. Patterson, B.Sc., a director of the Monlough Food Production Co. Ltd., is reported to have said, "Naturally I am delighted (with the competition successes) but not altogether surprised. The climate and growing conditions in Northern Ireland are about ideal for mushroom growing and we produce our own pure-culture mushroom spawn. Therefore we can produce top quality mushrooms which travel well to distant markets".

Among the cups won by the Monlough organisation was a new one given for a plate of twelve mushrooms by Messrs. Geo. Monro Ltd., of Hertford Road, Waltham Cross.



For good measure Mr. Rov Groom, playing from 18, won the golf competition for the Sinden trophy, after a very close call from Mr. R. D. Dumbreck (9), from Fife, Scotland, the competition proper ending in a tie, the winner eventually being decided on the score for the final hole—and what a hole that was!

Any fears that Weston-Super-Mare would not be very popular with members, situated as it is in a Popular winner of the Sinden golf trophy was Mr. Roy Groom of Irish Nurseries Ltd., Dublin. Mr. S. A. F. Sampson is the donor of this trophy. are somewhat few on the ground,

were dispelled a few days before the conference when the number of tickets taken topped the 200 mark.

The "get together" on Monday evening again served its purpose in getting the growers together, new and old, before the more serious part of the programme got under way on Tuesday morning. During an interval the delegates were welcomed to Weston-Super-Mare by the Deputy Mayor, Councillor Moore, who took the place of the Mayor, Councillor G. A. Parrott, J.P., who was unavoidably prevented from attending. Councillor Moore, who was accompanied by Mrs. Moore, was welcomed by the MGA Chairman, Mr. P. B. Stanley-Evans who, with Mrs. Stanley-Evans, met the Weston representatives at the door of The Grand Atlantic Hotel, a very satisfactory venue for this conference.

On Tuesday afternoon the mushroom competitions and the golf competition, which attracted fourteen entries, were decided and, in the evening, there was an impromptu discussion on "Massed Pinheads" from which a few growers appear to be suffering. Including this evening session there were, in all, five serious sessions on Tuesday with Mr. Stanley-Evans occupying the Chair throughout.

443

Throughout. Wednesday was occupied with seven separate papers and, although a start was made at 9.30 a.m. questions and answers were still in full swing at 5.15 p.m., when Prof. Dr. R. von Sengbusch, Director of the Max-Planck Institut fur Kulturpflanznzuchtung at Volksdorf, Hamburg, Germany concluded his long awaited paper and the questions which it provoked, on "Active Mycelium Spawning".



One of the leading speakers at the conference was Dr. R. son Sengiousch of the Max-Planck Institut, Volksdorf, Hamburg, here seen being specially welcomed by the Deputy Mayor of Weston-Super-Mare, Councillor Moore, Others in the picture are (L. to R.), P. B. Stanley-Evans (MGA Chairman), A. M. Vos (Venlo, Holland), Mrs. Moore, Mrs. Stanley-Evans and Mrs. von Sengbusch.

Even so, this was not the end of the serious business for Mr. C. R. Rasmussen from Denmark spoke for a few minutes on "Through Spawning" and "Super Spawning", bringing his experiments in this field up to date, as far as time allowed.

The Chairmen on Wednesday were:—Mr. E. G. Gook, Mr. Graham Griffiths, Mr. Fred. C. Atkins and Dr. R. L. Edwards, formerly director of the Mushroom Research Association.

About twenty ladies enjoyed the coach outing to the Cheddar Gorge and other places of interest on Wednesday when, luckily, the weather was glorious.

Also on Wednesday, the window dressing competition was judged by Mrs. P. B. Stanley-Evans and Miss Buchanan, of the *Bristol Evening World*. Unfortunately the number of entrants was disappointing, quite the lowest since this publicity aid was introduced in conjunction with the annual conferences and exhibitions organised by the MGA.

The Grand Atlantic Hotel presented a gay scene on Wednesday evening when the Mayor and Mayoress of Weston-Super-Mare, Councillor and Mrs. Parrott, representing the Weston-Super-Mare Local Authority, gave a reception and dance.

Stouter

W D WORTHIN

In the hotel foyer, Councillor and Mrs. Parrott were met by Mr. and Mrs. Stanley-Evans representing the MGA and Mrs. Garrett, Assistant Secretary to the Association, presented the two ladies with



One of the Judges, Mrs. Clifford King of Horsell Common, Woking. Surrey, has a close look before casting her vote.

beautiful bouquets. Mr. Graham Griffiths (Vice Chairman of the MGA) with Mrs. Griffiths were also both in attendance and later, when the reception got under way, each guest was officially received by the Mayor and Mayoress and Mr. and Mrs. Stanley-Evans. Each lady guest was presented with a carnation on arrival.

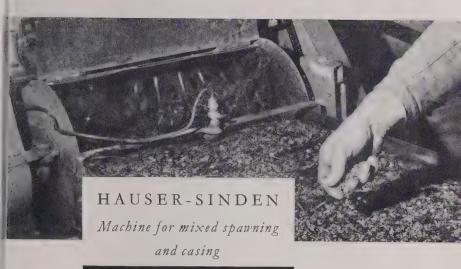
The various competition awards were presented by the Mayor and there were thanks and congratulations all round. The dancing continued afterwards and did not end until midnight. There was a bumper attendance, dispelling once and for all any doubts about the popularity of events of this nature.

Mr. Stanley-Evans expressed thanks to all those who had been associated in any way with the success of the conference and had a special word of thanks for Mr. G. W. Baker for untiring work, the MGA Staff and the ladies who worked very hard in connection with the competition classes—Mrs. Baker, Mrs. A. Jones, Mrs. N. R. Cooper and Mrs. G. V. Allen.

Originally it had been decided not to publish the complete papers, together with the questions and answers which followed each paper, until mid-way through 1961 as it was felt that his was only fair to those



Three of the judges at work during the mush-room competition judging, A. M. Vos (Holland) on the left Mrs. E. N. Smith (Faversham, Kent.) and Flt. Lt. J. E. Stevens (East Grinstead).



Mixed Spawning is no novelty which the grower has to try at his risk. Backed by seven years of practical experience as well as carefully controlled experiments, many times repeated, 25 million pounds of mushrooms per year are now being produced using this method under the most diverse conditions in nurseries all over the world.

Mixed Spawning with the machine we have developed (Brit. Pat. Nr. 850,496) gives security and evenness of yield and also makes possible increased yield and earlier production by using increased amounts of spawn. Casing with the same machine is a practical and economical operation.

Our machines are being manufactured in the U.K. under licence by Messrs. N. Tamplin & Co. Ltd., General Engineers, Birdham, Chichester, Sussex.

Information available from:

HAUSER CHAMPIGNON LABORATORIUM GOSSAU-ZURICH · SWITZERLAND or

MESSRS. N. TAMPLIN & CO. LTD., BIRDHAM · CHICHESTER · SUSSEX.



Overkeard at the Conference "Seeing that chap looking just like his dog makes me hope to goodness we never get to look just like mushrooms."



MORE WINNERS

G. C. Griffiths (L) S. J. Pointing (bottom left) and D. P. Clifford (bottom right)



For Cheaper FISH TRAYS . .

Ring RODNEY 2688

ALBANY ROAD, CAMBERWELL, S.E.5 282

DISTANCE NO OBJECT

ALSO SUPPLIER OF KIPPER BOXES, FILLET BOXES & BOXES OF ALL DESCRIPTIONS

growers who had attended the conference and paid the special fee of 30 - —it was announced in *The Bulletin* some time ago that a complete set of papers could be had by those not attending, at a charge of 30 -. However, the Trade Press covered the events to a somewhat greater extent than had been anticipated and, in view of this, it has now been agreed that the papers, with questions and answers, will be published, in *The Bulletin*, at the first available opportunity. It is hoped to publish the complete set in the January, 1961, edition but it may be necessary to hold some over until the February number. Even so, some growers may not wish to wait that long and they, if they desire, may have complete sets of papers at a cost of 10/-.



J. P. A. Winder (Leeds) drives off in the golf competition, watched by his partner, Sqn. Ldr. P. J. Hearne, D.F.C. (Luton).

Because of the decision to publish the papers without undue delay this report of the conference does not contain any details of any of the papers given and the titles and the speakers appeared in *Bulletin No.* 129 (September, 1960), p. 338.

Mr. Graham Griffiths was chairman of the organising committee on which the MGA chairman, Mr. P. B. Stanley-Evans served ex officio. Also on the committee were Mr. G. W. Baker and Mr. Eric Bateman. Mr. Griffiths organised the golf competition.

Mr. F. C. Atkins and Dr. R. L. Edwards edited all the conference papers and are to be specially thanked. Miss Valerie Baker organised the local publicity

which also included arranging with the South Western Gas Board at Weston-Super-Mare for special cookery demonstrations, with mushrooms, to be given on Monday, Tuesday, Wednesday and Thursday of the conference week.

RESULTS OF MUSHROOM COMPETITIONS

MGA CUP

1st Monlough Food Production Co., Ballygowan, Belfast.

2nd Broadham Produce Co., Oxted, Surrey.

3rd Darland Agricultural Products, Gillingham, Kent.



Top: Mrs. R. Patterson receives one of the cups whilst Mr. R. Patterson (left) and Mr. Fred. Patterson smillingly hold a mushroom tray in which they transported the Monlough cups, "en masse"

Patterson similing fold at a missiroom tray in which they transported the Montough cups, and masses
BELOW: Mr. G. W. Baker shaking hands with The Mayor whilst his partner in the Broadham
Produce enterprise, Mr. Arthur Jones, holds one of the trophies.

MOUNT CUP

1st Monlough Food Production Co.

2nd Broadham Produce Co.

3rd Darland Agricultural Products.

BROOME & GREEN CUP

1st Broadham Produce Co.

2nd Monlough Food Production Co.

3rd S. J. Pointing, Byfield Farm, Bath, Somerset.

SMART CUP

1st Broadham Produce Co.

2nd Monlough Food Production Co.

3rd S. J. Pointing.

THWAITES CUP

1st Monlough Food Production Co.

2nd Broadham Produce Co.

3rd The Wrington Vale Nurseries, Congresbury, Somerset.

STABLE MANURES CUP

1st R. J. McBriar, Overdale, Saintfield, Belfast.

2nd S. J. Pointing.

3rd E. J. Bateman, Bristol, Glos.

T. J. POUPART CUP

1st Monlough Food Production Co.

2nd Broadham Produce Co.

3rd S. J. Pointing.

GEO. MONRO CUP

1st Monlough Food Production Co.

2nd Broadham Produce Co.

3rd R. J. McBriar.

WINDOW DRESSING COMPETITION

1st (£15), R. J. Scobie, Waterloo Street, Weston-Super-Mare; 2nd (£10), T. S. Bevan, Orchard Place; 3rd (£5), Ian Gibson, Meadow Street.

ON SOUTHERN T.V.

On Sunday, 21st October, Southern Television devoted the whole of their "Farm in the South" programme to mushrooms.

A film, taken at the nurseries of Messrs. A. G. Linfield Ltd., of Thakeham, Pulborough, lasted about fifteen minutes and a further ten minutes was taken up by recorded interviews with Mr. Peter Linfield, a director of A. G. Linfield Ltd., and the Secretary of the MGA. The interviews were recorded at the Southern Television studios at Southampton, on Friday, 19th October. The interviewer was Mr. John Leese.

"The Grower" subsequently described the programme as "outstanding". It is understood that there may be a repeat sometime early in the New Year.

ANOTHER WESTON CUP WINNER



Mr. and Mrs. R. J. McBriar of Saintfield, Overdale, Belfast, receiving their mushroom competition cup.

999

CALYPSO

THE MUSHROOM GROWER'S NIGHTMARE

Mushrooms? Broilers? Rabbits? Such questions Arise from Weston-Super-Mare suggestions! With queries rampant, each daybreak, Whether, or not, decisions to make Regarding changes intended to cushion Those summer knocks, by substitution Of normal continuous cropping habits In temporarily switching to broilers and rabbits. The problem's pondered all the day And into the dusk, without headway, Till bedtime arrives to lessen the strain With hopes that sleep will deaden the pain. Adjacent then, are dreamland's throes, And so the sleek subconscious flows Into whirlpools of rough and tumble Where castles rise and castles crumble, Utopia reigns within a vision-Yet, through it all, there's no decision To start broiler pens and rabbit huts, Thus chucking 'Rooms', avoiding gluts, Or, to 'stay put' and chance the crisis, And so, not miss the bettered prices!

F.P. (Belfast.)

You can make better compost more quickly and reliably-with

ADCO 'M'

SPECIAL MUSHROOM COMPOST ACTIVATOR GIVES
HIGHER FERMENTATION TEMPERATURES, AND A FIRST
CLASS COMPOST THAT ASSISTS THE SPAWN RUN

Many advantages are gained by using Adco "M" as an activator in composting. Chief among them is the higher temperature attained both in the compost heap and in the beds during the peak heating process. Look at the results that follow from these higher temperatures.

First of all, fermentation goes ahead at a faster rate. Composting takes less time and the finished product is ready earlier.

Secondly, you have greater assurance that your crop will be free of pests and disease. The higher temperature either kills off the pests inside the heap or drives them to the surface, where they can be dealt with by insecticides. High temperatures during fermentation are particularly vital in preventing disease such as Vert-de-gris, of which there is special danger when composting during the winter months.

More nourishment

If you use Racing Stable manure, or other manure in which excess straw is present, the use of Adco "M" is strongly advised. The fermentation of this type of manure takes place more rapidly and effectively when Adco "M" is added. You get a more thorough breakdown of the strawy material, which then becomes available as food for the growing spawn. So your compost provides more nourishment for the mushrooms, and you get a bigger crop.

Better spawn run

Adco "M" produces a good quality compost of even texture. It provides an

ideal medium for spawn run and helps to avoid greasy conditions, lack of aeration, and over wet compost – all of which delay mycelium growth. The spawn is able to make more rapid use of the food provided. It establishes itself more quickly and this is again a great help in preventing diseases and weed fungi. The faster the spawn grows and fills the compost the less likelihood is there of disease and weed fungi becoming serious competitors. A quick spawn growth also gives a quicker ultimate production.

You can have freedom from uncertainty in the composting process – by using Adco "M". It will pay you hands down. Adco "M" is specially formulated as a result of years of experiment, for the specific purpose of making mushroom compost. It can be used for composting with straw alone, if you wish. Or it can be used to compensate for variations in the quality and texture of your manure supply. Adco "M" provides the way to better mushroom compost every time.

Post this coupon for full details -
Adco Limited, Harpenden, Herts
Please send me your leaflet giving full details of Adco "M".
NAME
ADDRESS

STUDIES ON THE INFLUENCE OF CARBON DIOXIDE ON THE CULTIVATED MUSHROOM

By Dr. H. J. Tschierpe

Institut für Gemüsebau der Technischen Universität Berlin Direktor Prof. Dr. H. Riethus

(The original paper was published in "Die Gartenbauwissenschaft 24, 1, 18-75, 1959)

Experimental series 2

An exactly similar experiment was carried out in which, instead of an airstream with 0.5 volume per cent, an air stream with 1.0 volume per cent carbon dioxide was used. A difference from the experimental series 1 was that in the CO₂ enriched air-stream not even pinheads occurred.

The mycelial growth on the casing soil was as heavy as in the experimental series 1. In the set ventilated with CO₂-free air normal fruitbodies developed and no superficial mycelial growth occurred.

Experimental series 3

The third series was an enlarged repetition of the first. Immediately after casing (day O) four boxes each were treated

Set A: 0.0 per cent CO₂ in the airstream Set B: 0.5 per cent CO₂ in the airstream

Set C: CO₂- accumulation (culture boxes closed, no ventilation)

Set D: unspawned, CO₂-accumulation

Set E: placed in normal room air (CO₂-content 0.04-0.05 per cent)

Situation on the 7th day:

Set A: The mycelium is growing between casing soil and box-wall and thickens to strands and to first sporophores.

Set B: Unthickened hyphae grow through the casing to the surface of the casing.

Set C: The CO₂-content is between 6.03 and 7.50 per cent. Weaker mycelium growth, no thickening of the hyphae.

Set D: The CO₂ content is between 2.95 and 3.52 volume per cent.

Set E: As set A but with the difference that the fruitbody formation occurs nearer to the surface (see figure 35 to 38).

Situation on the 14th day:

Set A: The first sporophores have a diameter of 1 centimetre, no

mycelium growth on the surface.

The boxes in the 0.5 per cent CO₂ stream are completely overgrown with mycelium. The mycelium at the outer wall grows down to the bottom. No sporophore formation.

Set C: Mycelium growth on the casing surface, but not as much as in set B.

Set D: No CO₂-determination.

Set E: The first sporophores have a maximum size of 1 mm.

Situation on the 21st day:

Set A: Sporulating fruitbodies in all boxes. 9 Sporophores cropped with a total weight of 126 g; caps weight 85.2 g, stipes weight 40.8 g, i.e., the ratio of cap-: stipe-weight is about 2:1.

Set B: Mycelium growth on the casing soil surface. Single pinheads present but without further growth. Some form on the mycelium at the outer walls.

Set C: The CO₂-concentration is about 15.0—18.1 per cent. A thin uniform mycelium layer on the casing soil surface, no strands, no sporophores.

Set D: CO₂-concentration between 5.0 and 6.5 per cent.

Set E: The boxes placed in room air fruit normally.

Situation on the the 28th day:

Set A: The second flush is growing in all boxes (total: 12 buttons).

Set B: On the casing soil of all boxes a tight flaky mycelium. Only in some cases formation of strands and "pinheads". These pinheads stop growth at 5 mm. diam. Only in one culture box a fruitbody has developed up to sporulation. Total length 145 mm., cap weight 135 g, total weight 315 g.

Set C: Superficial but—compared with set B—weak mycelium

growth.

Set D: No CO₂-determination.

Set E: Sporophores of the second flush not yet visible.

Situation on the 30th day:

Set A: Sporulating fruitbodies picked from two boxes. Total weight 61 g, sum of the cap weights 42. 4 g, i.e., the ratio cap-: stipe weight is greater than 2:1. The total length varies between 32 and 65 mm.

Set B: and C: No fruitbody formation, mycelium growth on the

casing soil.

Set D: No CO₂-determination.

Set E: The second flush grows.

Situation on the 35th day:

Set A: Sporulating fruitbodies picked from the two other boxes. Four sporophores with a total weight of 59 g. Sum of cap weights 40 g.

Vigorous mycelium growth on the casing soil. No fruitbody

formation.

Set C: Mycelium growth on the casing soil. No fruitbody formation.

Set D: No CO₂-determination.

Set E: The second flush ready for picking.

Situation on the 42nd day:

Set A: Fruitbodies of the third flush visible.

Set B: Vigorous mycelium growth on the casing soil surface.

Set C: No CO2-determination. Set E: The second flush picked.

Situation at the end of the experiment

The experiment was concluded after 49 days. In the $\rm CO_2$ -free air stream 246 g fruitbodies were cropped in two flushes. The sum of the cap weights was 161 g. The sporophores of the third flush had reached button size on the 49th day. In the airstream artificially enriched with 0.5 per cent carbon dioxide only one malformed fruitbody developed in the whole time. All the boxes were overgrown with tight flaky mycelium that often also grows at the outer wall. In the boxes of set C also there occurred a vigorous growth of the mycelium. The mycelial growth, however, was weaker than in the 0.5 per cent $\rm CO_2$ -air stream. No mycelial strands or sporophores were formed. The $\rm CO_2$ -concentration on the 49th day was between 16.0 and 18.0 per cent. The $\rm CO_2$ -concentration in set D at the same time was between 7.0 and 9.1 per cent. On the boxes placed in room air (set E) two normal flushes developed. The third flush was not yet visible on the 49th day.

3. Discussion

The results described support the supposition mentioned in the first part of this paper which was based upon the results of the CO₂-determinations under commercial conditions, namely that for fruitbody initiation a CO₂-partial pressure gradient from the compost to the room-air is necessary.

Magnus' (1906), Hein's (1930) and also Lambert's (1938) supposition that the low carbon dioxide content of the air above the casing soil could have an influence on fruitbody initiation is supported by the experimental results described here. At the same time the experimental results of Mader (1943), Bels-Koning (1950) and Schisler (1957) could also be explained as CO₂ effects.

It has already been mentioned that Mader's experimental chambers could not have been airtight. Our results support this view, Mader obtained malformed fruitbodies if the air was washed in mineral oil. As mineral oil does not absorb carbon dioxide, and fruitbody initiation is not possible in the presence of high CO₂-concentrations. his chambers could not have been airtight. In those chambers whose air was washed through CO₂-absorbing materials and the effect of the CO₂-absorbing materials was added to the non-airtightness of the equipment, normal sporophores developed. This means that his results do not show differences in principle but only differences of degree: In those chambers where air was pumped through CO₂absorbing materials, CO₂-concentrations were low; because of that normal sporophores could develop. When the air was pumped through mineral oil, there were at some times—during the time of pumping because of leakage in the pumping equipment—low CO₂-concentrations in the chamber, and so fruitbody formation was possible. But the air was not pumped through a CO₂-absorbent, so that enough CO₂ could accumulate to cause malformed sporophores. If the air was not washed at all, the CO₂-concentration increased so much that there was not sufficient difference between the CO₂-content of the compost air and

the air above the casing soil (a low CO_2 -gradient) to allow fructification. The mycelium grew through the casing soil and spread out on its surface (as was the case, in our experiments), when artificially CO_2 -enriched air was used for ventilation.

The absence of a $\rm CO_2$ -gradient must also be the cause of the vegetative growth on the casing and walls of a badly ventilated cave, observed over a period of nine months by **Bels-Koning**.

And lastly also Schisler's experiments support the effect of carbon dioxide on the fruitbody initiation: he filled 2,800 ml. wide-bottom Erlenmeyer flasks with a layer of approximately 3 inches compost and casing soil, closed the flask with a double bored rubber stopper and fitted it to an equipment which made it possible to ventilate the flask and to determine the amounts of carbon dioxide produced. If the air was pumped through this system at the rate of 3 litres per hour, the mycelium grew onto the casing soil surface and no pinheads developed. Normal fruiting however, occurred when the rate was increased to 15 litres per hour. It seems that only in the latter case was the CO₂-partial pressure gradient big enough to cause fructification. At the low velocity the excessive CO₂-concentration in the flask prevented relative fruit body formation.

Also the relation between air: bed ratio and first time of cropping, observed by **Middlebrook** and **Storey** (1950), can be explained as a CO₂-effect. The low CO₂-concentration necessary for fruitbody initiation occurred earlier in the cropping rooms which had a relatively larger air space. Also the low yields in rooms with a low air: bed ratio could be caused by the high CO₂-concentrations in these rooms, because at high CO₂-concentrations the cap weight is reduced and therefore also the total weight. **Middlebrook** and **Storey** come to the conclusion that there is a close connection between the time of maximum yield and the time of maximum ventilation. By ventilation, however, CO₂-poor, fresh air is introduced into the house and so is created a CO₂-partial pressure gradient between compost air and room air.

The "unknown volatile substance", postulated by **Pizer** and **Leaver** (1947), **Stoller** (1945, 1952), **Schisler** (1957), et al. is, according to the results of our experiments, carbon dioxide.

CO₂-concentrations of more than 0.5 to 1.0 per cent prevent fruitbody formation but inhibit only imperceptibly the growth of mycelium. This different reaction of the mycelium and of the fruitbody-initiation-process to carbon dioxide might have led to the hypothesis of the existence of hormone-like substances in this connection. The superficial growth of the mycelium ("stroma" formation) is not caused by the influence of a stimulating substance. It occurs at a high relative humidity and at the presence of CO₂-concentrations of more than 0.5 to 1.0 volume per cent carbon dioxide. These CO₂-concentrations are too low to cause a severe inhibition of the mycelial growth; they are however, at the same time too high to allow fruitbody formation.

In other experiments, not described here, we have also seen that it is very probable that there exist besides the carbon dioxide other

volatile metabolic products. All the reactions of the mushroom, however, which other authors explain as the result of the influence of these substances, we could cause by treating the mushroom with different CO₂-concentrations. Therefore we consider these substances as metabolic products of an excretary character without any morphogenic or physiological influence.

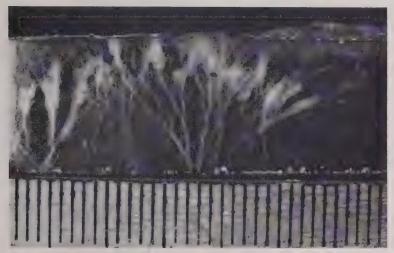


Fig. 35: Beginning fruitbody formation after nine days' ventilation with CO₂-free air (This and the next photograph were taken 9 days after casing).

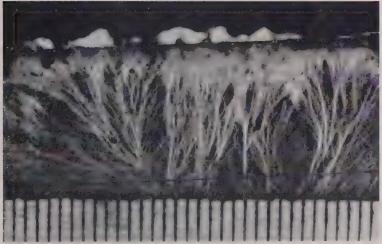


Fig. 36: Fruitbody formation in the boxes placed in unmoved room air. It is obvious that the fruitbodies develop near the surface.

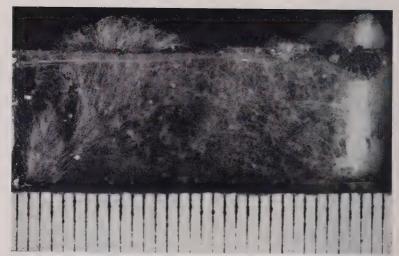


Fig. 37: No thickening of the hyphae in the boxes ventilated with artificially CO_2 enriched air $(0.5 \text{ per cent. } CO_2)$. The hyphae grow through the casing to the surface.



Fig. 38: No formation of mycelial strands in the boxes placed under accumulation conditions. Vegetative growth to the casing soil surface.

The Activair System

- ★ The Perfect Method of Controlling Air Movement in a Mushroom Shed
- ★ Specialist Equipment Designed to Heat and Ventilate Growing Rooms
- ★ Peak Heat etc., or Ventilate Only in conjunction with Existing Heating Schemes
- ★ Growers with ACTIVAIR EQUIPMENT Claim CROP INCREASES

Write for details to: The Technical Sales Department

ACTIVAIR LTD.

The Retreat, The Rutts, Bushey Heath, Herts.

Telephone: Bushey Heath 1506

Ensure
a
clean
start
in
pestfree
houses

with

MURPHY STERILIZERS

FORMALDEHYDE

A very effective sterilizer with excellent penetrating powers. It controls fungus diseases and harmful bacteria.

SPECIAL MUSHROOM ECA

A cresylic sterilizer specially prepared for washing down houses and dipping boards.

Full details and prices on application

THE MURPHY CHEMICAL COMPANY LTD

WHEATHAMPSTEAD - HERTFORDSHIRE

Blowing our own trumpet



For . .

MUSHROOMS

too we can offer a first-class sales service and an excellent outlet

FRANCIS NICHOLLS

Smithfield Market
BIRMINGHAM

Associated Companies in all the densely populated areas.

"MR. BESTO"
has proudly
served the vast
majority of growers
for over 50 years



USE BESTO CHIPS

(REGD. TRADE MARK)

Write to

THE BRITISH BASKET & BESTO CO. LTD.

AT ONE OF THE FOLLOWING ADDRESSES

CUXTON, Nr. ROCHESTER, KENT

LEVERINGTON ROAD, WISBECH, CAMBS.

L.M.S GOODS YARD, EVESHAM

INGLEBY WORKS, IRLAM, Nr. MANCHESTER

CROWNPOINT ROAD, GLASGOW, S. E.

PHONE
Strood 78211

Evesham 6119

Irlam 6

CROWNPOINT ROAD, GLASGOW, S. E.

Bridgeton 2742

SMALL ADVERTISEMENTS 4d. a word

PURE DRIED GROUND POULTRY MANURE. This pure, natural organic is regularly used by prominent mushroom growing firms. It represents an invaluable organic activator for stable manure. Finely and evenly ground, it is convenient and clean to handle and being packed in ½ cwt. sacks, the weight you receive is guaranteed. Sample and prices (which vary according to the distance for carriage from our Works) on application. Sole Producers:—THE HAMPSHIRE GUANO CO. LTD., SOBERTON, SOUTHAMPTON. (Est. 1937.) Manufacturers of "Gunos" (Regd.) Brand Fertilisers.

CHALK AND CARBONATE OF LIME. Best quality Ground Chalk and Derbyshire Limestone supplied in bags; also broken chalk and limestone. DERBY-SHIRE STONE LIMITED, Matlock. Telephone: 741.

REGULAR SUPPLIES of graded mushrooms required. Please write for Managing director to call. WRAY & PEASE LTD., Castlefolds Market, Sheffield 1.

NOTTINGHAM Company require mushrooms urgently. Write for managing director to visit you. Box No. 5.

MUSHROOM TRAYS. We have regular supplies of Danish and Norwegian fish trays for all your requirements. Please contact J. G. RODGERS, 4 Salisbury Row, London, S.E. 17. Telephone: Rodney 3640.

STERILISED SUB-SOIL for Casing Mushroom Beds; delivered in 10-15 ton tip up loads to any part of the Country. Particulars: F. A. SMITH, Homeleaze, Staunton Lane, Whitchurch, Bristol. Tel.: Whit. 2465.

HAVE YOU SEEN the new Microsol Generator? If not, please ask for demonstration as this Distributor of Atomising Concentrates is a *must* for all growers. Should you be requiring Lump Chalk, Activators, Disinfectants, Insecticide, Fungicide, Irish, Danish, Cumberland Swinefleet Peats, Spraying and Dusting Equipment, Therms., Baskets, Supplex, Fablothene, Gypsum, Dried Blood, Culverwell, etc., etc., etc., contact NORTHERN HORTICULTURAL SUPPLIES, Russell Street Chambers, Bingley, Yorks. Tel. 4383.

WHO? Will the member to whom Raymond Thompson lent an Air Movement Indicator kindly return it to him.

WATERLOGGED soil will not grow healthy crops. Land Pipes are obtainable from Coopers, Builders' Merchants, Ashford and Canterbury

MUSHROOM TRAYS, purpose built, from first class home-grown softwoods; highly competitive in price. E. & B. (Timber Products), Stanford Bridge, Worcester. 'Phone your requirements to Shelsley Beauchamp 341/2.

WANTED SECONDHAND manure turner—Marston, Shelfanger, Diss, Norfolk.



For clean Trays, Clean Houses, Clean Crops use

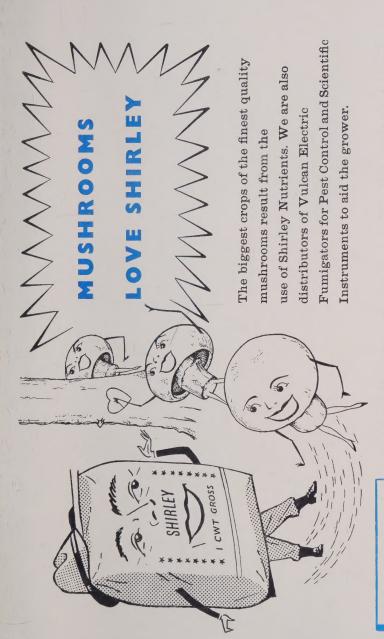
SANTOBRITE

and for hygiene on the farm!

Ask for Santobrite Leaflet from Sole Distributors:

J. E. R. SIMONS LTD. HARLOW · ESSEX

Specialists in every need for the Commercial Mushroom Grower



ORGANICS Limited SHIRLEY

HIGH FERTILITY AT LOW COST

VICARAGE WHARF · BATTERSEA · LONDON S.W.11

LEW

DAVIES

ESTABLISHED OVER 40 YEARS - (SMITHFIELD) LTD.

SMITHFIELD MARKET, MANCHESTER 4

MANCHESTER

IS AN EVER EXPANDING MARKET FOR

MUSHROOMS

YOU SEND - WE'LL SELL

SATISFACTORY PRICES are important to you and they are important to us also—we aim to hold your business. You may be quite sure we will do our best. PLEASE GIVE US A TRIAL

DAVIES IS THE NAME

MANCHESTER IS THE MARKET

Telephone: DEANSGATE 4841 - CHE. 3480